

national combinatorial bid would be inappropriate for such a company and would disadvantage it unnecessarily compared to a national bidder.

20. Even if the value interdependencies associated with a national roaming network proved to be of paramount importance, it would still not follow that a national license is essential to provide such a premium service. If the gains from such a system were sufficiently large, separate providers could work out interoperability standards and exchange agreements that permitted customers of one service to use the facilities in a different region for an extra charge. While we expect that working out such an agreement among separate companies would be more difficult than would be possible with unified ownership of licenses, we would still expect such an agreement to be reached if the value of these services were sufficiently high. If the value were low, there would certainly be no compelling reason of public policy to create an auction biased in favor of unified national ownership. On the contrary, public policy would then favor a system of multiple regional carriers whose performances could be publicly compared to pressure the companies to compete in providing superior service and cost performance.

21. Another possibility is that the major economic advantages of roaming services are obtained with subnational networks, which might also have certain advantages of greater variety, better exploitation of existing fixed investments, or better capability for rapid build-outs. As we argued in our initial comments, in this case, a system of national combinatorial bidding could prevent the formation of this more efficient licensing pattern. Since the Commission has not conducted comparative hearings in this case, there is little reason for it to suppose that it can guess which of these combinations is actually the most efficient one.

22. In summary, we see no plausible fact situation in which there are significant

efficiency gains to the use of combinatorial bidding and several in which there could be efficiency losses. The use of combinatorial bidding introduces complexity, bias and strategic manipulation and forces the Commission to select the groups of bidders in whose favor the outcome would be biased. Combinatorial bidding should be rejected.

II. Simultaneous versus Sequential Auctions

23. One of the most important differences among the various commenters on the NPRM are their positions regarding whether the various licenses ought to be auctioned simultaneously or in sequence. There are three basic types of positions: those who argue, as we do, that the licenses should be auctioned simultaneously (including NTIA, Nynex, and AT&T (though AT&T advocates this only on an experimental basis)), those who argue that subsets of the licenses should be auctioned simultaneously (including PacTel, Bell Atlantic, and Nynex), and those who argue in favor of a series of individual auctions of licenses.

24. Unlike the issue that is raised by combinatorial bids, the decision made by the Commission on this issue introduces only relatively minor biases in the auction mechanism. The main bias that is introduced is one in favor of sophisticated and well informed deep-pocket bidders in sequenced auctions, which arises from the need of bidders in the earlier auctions to anticipate the likely levels of bids in later auctions and to use their forecasts to bid cleverly in the initial auctions. Besides that relatively subtle bias, the principal considerations in deciding between a sequence of auctions, a simultaneous auction, or some hybrid are (1) issues of feasibility and novelty of the design and (2) issues of the likely efficiency of the allocation.

25. In comparison to the familiar sequential oral auctions, simultaneous auctions of

multiple objects of the sort we propose are less common. Securities exchanges do sell their various securities on a simultaneous basis even though traders are managing portfolios of securities. But this is an imperfect precedent for several reasons, most importantly that value interdependencies in stock purchases are much smaller than those anticipated in the PCS spectrum auctions, that the ranges of likely trading prices are much more narrowly defined, and that the retrading opportunities are much greater.

26. While we acknowledge that there is extensive experience with oral auctions, there are serious differences between that experience and the situation in the PCS auction. The value interdependencies that make the securities markets an imperfect precedent also cast doubts on the usefulness of any precedents involving the sale of such things as art or wine or jewelry, cattle or tobacco or tractors.

27. The sheer time required to conduct a sequence of oral auctions is one problem. As a rough estimate, suppose that each license requires just one hour on average to be auctioned. This one hour includes the time needed to verify the identities of the bidders each day, to establish the eligibility of bidders on a license, and to conduct the actual bidding, as well as time between auctions for individual licenses to allow bidders to assess how completed auctions affect their available funds and their value interdependencies and to consult with their home offices as would certainly be necessary and desirable. Then, with 2,562 broadband PCS licenses to be sold, the process for these licenses alone would take 2,562 hours, which is 320 business days or about 64 weeks for the broadband licenses alone. If there is a pause between auctions of, say, MTAs and BTAs, the required time could be even longer.

28. The Commission could try to overcome this problem by further accelerating the pace

of the oral auctions. Even if it were possible to complete each auction in an average of ten minutes, including administrative procedures and brief breaks between sales of individual licenses, fifty two business days would be required for completion. This is longer than we estimate our proposed auction design would require using the activity rule suggested below. Moreover, the time pressures on bidders in such a fast-paced auction would force them to adopt simple reservation price strategies, with limited adjustments for value interdependencies and funding limitations. Time pressure would drastically restrict the possibility of implementing contingent strategies utilizing the information that emerges during the course of the auction. The ability to respond to such information is the principal advantage of oral auctions over simultaneous sealed-bid auctions, and it would be destroyed by a too-rapid auction design. Some bidders could be forced to limit their participation, resulting in both an inefficient allocation of licenses and lower revenues for the Treasury than might otherwise be obtained. Bidders who were foreclosed by the speed of the auctions would probably attempt to acquire additional licenses after the auction in secondary market transactions. With fuller participation possible in the secondary market than in the original auction, the secondary market prices would tend to be higher than the auction prices, resulting in "unjust enrichment" of some auction participants.

29. The appendix to this report contains a detailed description of how our proposed design would be conducted, including procedures for bid submission and verification and a full description of the respective roles of the FCC and the Contractor who conducts the actual auction. In addition, we are prepared to present a prototype spreadsheet program to implement the auction for review by the Commission. The detailed description proves the feasibility of our proposal.

30. In view of the foregoing analysis, we conclude that oral auctions have no advantage in terms of feasibility over a system of simultaneous auctions. At the same time, on efficiency grounds, a simultaneous auction design would be unambiguously preferred over a sequence of auctions. The reason is that a simultaneous auction allows bidders to react to the prices that prevail on various licenses with minimal need to guess about future prices. In a sequential auction, by contrast, if band A licenses are sold before band B and if the bid prices for some band A licenses were very high while others appeared attractively low, a national bidder might have to decide whether to purchase just the low-priced licenses and seek a limited network or whether to wait for bidding to open on band B, at which time it might hope to find more favorable prices for building a national network. Or again, a regional bidder would have to decide whether to take a band A license at its offered price or whether instead to wait for a possibly better price on a band B license. If the bidders decide wrongly—for example, if the two bidders with the highest values for the 30 MHz MTA licenses choose to wait for a better deal in band B, then one of the two would necessarily fail and the resulting allocation would be inefficient. A simultaneous auction that is not unnecessarily accelerated would allow bidders to react to a full set of prices on all the properties being sold, avoiding the guesswork by bidders that would be required by the sequenced auctions we have described.

31. Having established the theoretical advantage of simultaneous auctions, let us return to practical considerations in implementing the auction, beginning with an evaluation of the problems facing the bidders and the bidders' need for time to determine bids during the actual auction.

32. With individual licenses fetching prices in the millions, tens of millions, or even

hundreds of millions of dollars, the human agents representing corporate bidders in these auctions will mostly not be bidding on their own discretion. Rather, they will be operating with close supervision and control of their company's highest officers and subject to limits imposed and revised by their boards of directors. There will be many factors that bidders will want to take account of during the course of the auctions. The most obvious of these arise from value interdependencies, that is, the amounts that bidders are willing to commit to individual licenses may depend on whether they have been able to or expect to be able to acquire certain other combinations of licenses. Those expectations in turn will depend on the early auction outcomes. But value interdependencies are not the only considerations that will tie the bids on the various licenses together. Boards of directors will establish budget limits; eligibility restrictions based on the amounts of spectrum already purchased may become binding; estimates of the final prices for licenses in various regions will be updated; bidders may learn who their primary competitors are in various markets and in nearby markets and may evaluate how the changing circumstances are affecting their competitors; and so on. All this evaluation takes time, and the stakes for many companies are enormous. Indeed, the eventual survival of some companies may be at stake.

33. In view of the stakes and the severe demands on the bidders' capabilities for processing and analyzing information, there are obvious advantages to conducting the auction at a deliberate pace. Indeed, such a pace is desirable in these auctions for much the same reasons that long times are allowed between bids in auctions of companies that are "in play" in the takeover market. Failing to provide adequate time during the auction would likely result in inefficient allocations of spectrum as well as a loss of revenue to the government.

34. The design we have proposed would allow time for the important information

processing, analysis and control tasks that we have described, but it would use that time relatively efficiently. We would prefer to allow even more evaluation time for bidders but, as a practical matter, with 2,562 broadband PCS licenses up for auction, a workable design must incorporate some features to speed up the bidding process, even though the speeding up of the auction necessarily also limits the amount of information processing, analysis and control that bidders can do.

35. Besides the two pure designs—simultaneous or sequential, some commenters proposed intermediate designs involving staged auctions. For example, the Bell Atlantic and PacTel proposals call for simultaneous auctions for bands A and B to precede simultaneous auctions for certain other bands. This proposal has the disadvantage that it forces bidders in the initial round to guess about what the prices and their opportunities will be in the other bands. If bidders make different guesses, then bidders who are relatively optimistic about the opportunities in the other bands will bid less aggressively, and the allocation may be made to the more pessimistic bidders, even if they are not the highest value bidders.

36. The main advantage of the multistage auction compared to our proposal is one of expediency: with fewer licenses being sold at auction in each round, the complexity of the auction is reduced and the time required to conduct the auction would likely be reduced. The best such proposals still entail the auction of substantial portions of the spectrum simultaneously, and especially those portions that entail the most important substitution possibilities. For example, they call for auctioning the A and B bands simultaneously, in order to allow for the close substitutability of the two bands. This preserves some of the efficiency advantage of a simultaneous auction. Such an auction design would, however, allow fewer opportunities for

bidders to compare strategies based on collections of BTA or MTA licenses. This limitation is a highly undesirable attribute of the auction from the standpoint of efficiency.

37. We strongly caution the Commission against putting too much emphasis on rapid completion of the auction. An auction is not just a process of establishing selling prices: it is a means of allocating resources. For a resource allocation problem of this complexity and with stakes estimated in excess of \$10 billion, it is decidedly worthwhile not to hurry the process. Giving the bidders ample time to process the information that emerges during the auction and to confer with their boards of directors will most likely increase both the efficiency of the auction and the revenue it generates for the government.

III. Possible Modifications to Our Design

38. We believe that our design serves the goal of efficiency better than any of the alternatives that have been proposed. Nevertheless, some of the features that have been incorporated into the designs of other commenters are at least superficially appealing. Most of these could be incorporated as successfully into our design as into any other. Some of these features would do little damage to the efficiency of our proposed design. Others would be significantly more damaging, as indicated below.

39. **Bid Withdrawal Penalties.** According to auction design we proposed, if a bid is withdrawn, the bidder must both forfeit the deposit on that license and withdraw from each other license that it had won. Other proposals involved lesser penalties—usually just the forfeiture of the deposit on that particular license.

40. As we explained in our initial comments, substantial penalties for bid withdrawals

serve to discourage insincere bidding. Here is one example of the type of insincere bidding that bid withdrawals would make possible. A bidder that wished to deter the formation of a national collection of licenses by one of its competitors could bid aggressively on a few of those licenses, hoping to drive up the price enough to make the national collection appear unattractive, and intending to default if it gets stuck with the license. Strategies of that sort could destroy the efficiency of the allocation process even if no default occurs, by distorting the price information that emerges during the auction. When defaults do occur, the problem of restarting the auction following the default is a difficult one to which only imperfect solutions are available. Especially with simultaneous auctions of multiple licenses, it is imperative that the auction design strongly discourage such defaults.

41. We believe that our initial design, which would allow bidders to dispose of unwanted licenses in the secondary market, provides adequate protection for sincere bidders who fear that they may become "stuck" with a group of licenses that is inadequate for their network strategies. At the same time, our design would deter most defaults, especially those by major bidders bidding for multiple licenses. Nevertheless, if the default penalty of forfeiting all licenses is deemed too harsh and the Commission limited the default penalty to the amount of the license deposit, our proposal with that default rule would still be preferable to the alternative proposals.

42. **Linked Auction Designs.** A second proposal, suggested by Bell Atlantic and their experts, Jeremy Bulow and Barry Nalebuff, involves linking the auctions of certain bands. The possibility of some kind of linkage is also mentioned by PacTel and by General Communications, Inc.

43. The Bell Atlantic proposal involves conducting four auctions. The two 30 MHz MTA

bands, A and B, would be auctioned together and the three 10 MHz bands, E, F and G would be auctioned together. Thus, instead of two auctions in each MTA and five in each BTA for the various spectrum bands, there would be just one auction in each MTA for bands A and B, one each for C and D, and one for E-G. The details of the Bell Atlantic proposal are incomplete, and these details do matter for an evaluation of the likely outcomes.

44. Let us focus on bidding for the two 30 MHz bands; bidding on the 10 MHz bands E-G in the Bell Atlantic proposal would be similar. The Bell Atlantic proposal then seems to be as follows. Auctions for licenses in the 51 MTAs would be conducted in sequence. In the first MTA, an ascending bid auction would be conducted for the two licenses, without any distinction being made between the A and B bands. After the two winners were identified, they would enter a further ascending bid auction for the right to choose which of the two available bands in that MTA they prefer. Bidding on bands E-G would work similarly, with the three winners bidding for priority in their choices.

45. If the various bands in each group were truly identical and if the procedure could be made compatible with simultaneous sales of all licenses, then this procedure would work quite well. It would reduce the seven auctions on bands A-G to four. Consolidation of this sort is desirable if the cost is not too high.

46. We think, however, that the cost is too high, for two reasons. First, the bidders could find substantial differences between, say, bands A and B in a given location, especially if licenses in different geographic areas were sold in sequence as Bell Atlantic proposes. For example, suppose there were three geographically contiguous regions 1, 2, and 3 in which bands A and B were being sold. Suppose that the auctions for regions 1 and 2 had been completed and

that Bidder 1 had acquired the A-band license in region 1 and Bidder 2 had acquired the A-band license in region 2. Suppose each of these bidders hopes to form a larger network by acquiring the A-band license for the contiguous region 3, but does not wish to acquire the B-band in region 3. Under these conditions, it may be that the total-value-maximizing allocation of licenses would assign the A-band license in region 3 to one of these bidders and the B-band license to another bidder, say bidder 3. However, the auction proposed by Bell Atlantic does not allow the two regional bidders to bid on the A-band against one another without risking acquiring a license for the unwanted B-band. A similar objection applies to the auction of bands E-G.

47. Second, this "linked-bands design" is difficult to apply in a simultaneous auction, because the ordering of the MTAs for choosing preferred bands would then become a substantive issue. Note well that the preceding description of the Bell Atlantic proposal relied substantively on the assumption that the different geographic areas were to be sold in sequence.

48. **Closing Rules.** Another way to vary our design would be to alter its rules for closing the auctions. There are two possible reasons to make such a change. One is simply to accelerate the auction. The second is to facilitate the aggregation of licenses over large regions by settling some of the key licenses early, allowing the national or multi-regional licenses to be built on that base.

49. In the PacTel proposal, bidding closes on a license-by-license basis as the bidding on an individual license pauses or stops. That proposal calls for setting a sequence of minimum bids designed to encourage active bidding on each license throughout the entire auction. This design has the disadvantage that it prevents the bidders from exploring their strategies sequentially. For example, a LEC might seek to bid first on the MTA licenses in its areas of

interest and only later switch to bidding on the BTA licenses if the initial strategy is unsuccessful. That way, it could avoid running afoul of the limits on licenses that it can acquire in a region. In the PacTel design, bidding on some BTA licenses might be closed by the time the outcome was finalized on the MTA licenses in the same geographic region.

50. To allay the possible concern that bidding on a few licenses in low traffic areas could substantially delay the closing of the entire auction, several variations of the closing rule are possible. According to one, all the licenses A-G in a major trading area, including the licenses for basic trading areas comprising the MTA, would close simultaneously when activity on all the licenses in that area ceases for a suitable period, such as three business days. With the daily bidding in our proposed design, this would allow affected bidders ample warning when the licenses in an MTA were about to close, forcing an early consideration of a change of strategy.³

51. Like all variations on our simple design, changes in the closing rule would raise new strategic opportunities for firms. Firms would get some control of the pace of the auction, and would seek ways to exploit that control to disadvantage competitors. For example, a firm might keep bidding open on the 30 MHz licenses in an MTA by bidding on a BTA in that region. Our design was intended to limit such strategic opportunities by closing all licenses together.

52. **Activity Rules.** Our present design requires a bidder to be "active" on every bidding day on penalty of being withdrawn from the auction. A bidder is deemed "active" if it has the highest outstanding bid for some license on the previous day or if it submits a new bid that

³This closing rule would duplicate the advantages of the auction design proposed by Telephone and Data Systems, Inc. and their expert Robert Weber. However, it would avoid the disadvantages of sequenced auctions for different geographic regions that is inherent in their proposal.

exceeds the highest bid from the previous day on some, one license. The purpose of this rule is to ensure that no bidder "lays back" and waits to see what the clearing prices appear to be before participating in the auctions. However, it still allows bidders who aspire to aggregate a large group of licenses to begin by bidding on a much smaller number of licenses than it intends eventually to acquire, resulting in slow progress of the auction.

53. Indeed, in a worst case scenario, in which each firm on each day places the minimum number of bids required to be deemed active, the auction design we initially proposed could take a very long time to close, with prices rising slowly and only a handful of licenses receiving new bids on each day. We consider it to be highly unlikely that such a scenario would occur, and we are concerned that closing rules designed to rule out such strategies by closing different licenses at different times would invite strategic responses. A more direct way to rule out such worst case scenarios is to strengthen the activity rule. Moreover, this strengthening is much less subject to strategic manipulation than the alternative of a closing rule that applies separately to each license being offered.

54. A stricter "activity rule" could require each bidder to bid actively at a level commensurate with its intended collection of licenses. At the beginning of the auction, each bidder would be required to declare its desired total eligibility for licenses, measured in MHz-POPs, and to pay the corresponding deposit of two cents per MHz-POP. The bidder's eligibility to continue to bid for licenses during the auction would depend on its continued active participation. The required level of activity could vary during the course of the auction, in order to allow a period of exploratory bidding to be followed by periods of final jockeying and closing.

55. In this design, the auction would be conducted in three phases, beginning with phase I. During phase I, a bidder that is active on at least one-third ($\frac{1}{3}$) the amount of spectrum for which it is eligible would retain its existing level of eligibility. However, a bidder that is active on less than one-third would have its continuing eligibility reduced to three times its current activity level. For example, a bidder that was eligible to bid on 900 million MHz-POPs and that was actually active on only 200 million MHz-POPs would have its continuing eligibility reduced to 600 million MHz-POPs. To guard against clerical errors or unusual circumstances that might delay a bidder's bid preparation or submission on a particular day, each bidder could request waiver of this activity rule as applied to its own bids not more than once in each three business days, and such waiver would be automatically granted. This rule would ensure a high level of activity during the Phase I of the auction, with some bidders dropping out or scaling back their participation as prices rise. As a further protection against clerical errors or uncontrollable circumstances, we recommend that each bidder be allowed two additional automatic waivers. The details of the waivers are described in the appendix.

56. When bidding activity has fallen to the point where the highest bid has changed on no more than five percent of the licenses being offered (which would be 128 licenses if all the PCS broadband were sold together) over a period of three consecutive days, the auction would move into phase II. During this phase, a bidder that is active on at least two-thirds ($\frac{2}{3}$) the amount of spectrum for which it is eligible would retain its existing level of eligibility. However, a bidder that is active on less than two-thirds would have its continuing eligibility reduced to one-and-one-half times its current activity level. For example, a bidder that had been eligible to bid for 3000 million MHz-POPs and that is actually active on only 1000 million MHz-POPs

would have its eligibility reduced to 1500 million MHz-POPs. Again, the waiver rule would apply: a bidder could request one automatic waiver in any period of three business days.

57. Phase III would begin when the bidding activity in Phase II had fallen to the point where the highest bid has changed on no more than two percent of the licenses being offered over a period of three consecutive days. During Phase III, a bidder that is active on less than that amount of spectrum would have its continuing eligibility reduced to match its current activity level. Again, the once-in-three-day waiver rule would apply.

58. Although we expect the activity rule described above to ensure that the auction moves along at a brisk pace, we recognize that some will argue for a still faster close to the auctions. While we think a faster closing would be ill-advised given the huge dollar sums at stake and the need of the bidders to respond to new information during the conduct of the auction, our design could be modified to further shorten the time required to complete the auctions. This could be accomplished by introducing modest reserve prices, modifying the transition rule between phases to cause quicker transitions, or by adjusting the required fraction of eligibility on which a bidder must be active to maintain its full eligibility in each phase. We do not favor these changes, however, as we believe that excessive speed will damage the efficiency of the allocation. Instead of increasing the speed of the most likely cases, we suggest a rule designed to eliminate entirely the possibility of very long delays in completing the auction. This rule would permit the Commission, after forty rounds of bidding, to accelerate the auction by advancing it to phase II or III if it has not already advanced to that phase. Under limited circumstances, the proposed rule would also permit the Commission to call for a final round of sealed bids for those licenses on which bidding is still active. The details of these and other "safety valve" procedures are

described in the appendix.

59. The activity rule is designed to require bidders to participate actively throughout the auction. We expect this rule would force quite a fast pace, yet without foreclosing opportunities for bidders to pursue multistage strategies. For example, in this design, a bidder might first pursue a strategy of forming a national network and bid accordingly, with a fallback of forming a network of licenses in the Eastern United States. Or, it could begin by bidding to acquire an Eastern network and, if successful, it could begin to bid to expand that network after bidding activity on the licenses had tentatively stabilized.

60. **Minimum Bid Increments.** Some commenters, especially PacTel and their expert adviser, Preston McAfee, have proposed sophisticated systems for setting minimum bid increments during the auction. These are designed to force the pace of the auction at the early stages while still allowing competition with small bid increments late in the auction. We think that our strict participation rule provides adequate pace and, indeed, if that rule is adopted, we would favor reducing our suggested minimum bid increment from five percent to the smaller of five percent or \$5 million. We would also be amenable to using phase- and license-type dependent minimum bid increments as described in the appendix, with smaller minimum increments at later phases of the auction.

61. **Reserve Prices.** We expect that most of the licenses being offered for sale will be subject to intense competition, so that the main danger in setting reserve prices lies in setting them too high and thereby preventing any sale from occurring. However, in some remote BTAs where the need to meet an early build-out requirement is daunting, the competition for spectrum could turn out to be light. A low reserve price or no reserve price would encourage some party

to undertake the provision of PCS services in that area, though without producing much revenue for the Treasury. A higher reserve price would allow these licenses to be auctioned later, delaying the introduction of PCS services but possibly yielding higher revenues for the Treasury. Using reserve prices to prevent the sale of these licenses would not be consistent with the policy priorities established by Congress and reported in the NPRM.

62. Bidder identities. Several of the commenters have suggested that concealing the bidders' identities will be an important factor in limiting explicit and implicit collusion during the auction. We believe, however, that explicit collusive behavior is adequately deterred by existing antitrust laws and that the factors that tend to promote implicit collusive behavior in auctions are mostly absent in this setting. Specifically, there will be no repeated interactions in similar auctions, no homogeneity of interests resulting from uniformity of the licenses being sold, and great heterogeneity among the bidders, their capabilities and their business strategies. All of these factors serve to promote competition and undermine collusion. Withholding bidders' identities during a simultaneous auction prevents bidders from evaluating the kinds of services that will be offered in the areas they would serve and the potential for offering joint arrangements to customers in different areas. Each of these kinds of information could be an important part of estimating the value of a license. Withholding identities also makes it harder for bidders to assess the bid data that emerges during the course of the auction and to plan their strategies in response to those assessments. To promote the information flow that is needed to find an efficient allocation of licenses, we favor a design in which the identities of the leading bidders are always revealed.

Appendix
Illustration of

Auction Rules and Procedures

The specifications presented here are designed to encourage closure of the auction in approximately thirty rounds, each lasting one day, and to force closure shortly after forty rounds. The parameters (indicated below by **numbers**) in the following description can be adjusted to accelerate closure if necessary. For instance, the parameters can be adjusted to encourage or force closure of the auction in half the time.

Those tasks that can be done by a contractor hired by the FCC to conduct the auction are indicated. The Contractor's responsibility could include adjustment of the parameters, based in part on results from laboratory experiments conducted by a subcontractor, to ensure that the design encourages closure of the auction within the interval desired by the FCC. The Contractor may also be responsible for preparation of instructions for the bidders. The instructions should present the Activity Rule [described in part III] in terms easily understood by bidders, and with examples that illustrate how this rule limits the advantages of a wait-and-see strategy, and encourages sustained bidding activity throughout the auction.

Definitions of Terms

The following terms are used to describe the auction rules and procedures. A "round" of the auction is 1 full day on which the auction continues, the Contractor receives bid submissions, and receipt of submissions for that round is closed at the end of the day, followed by the Contractor's announcement of an official status report that specifies for each license: the current highest bid and the bidder(s) submitting that bid.

The role of the Activity Rule is to promote a timely conclusion of the auction by encouraging active bidding early. At the beginning of a round, the "activity level" of the auction is the sum of the MHz-pops of those licenses whose highest bid increased in at least 1 of the previous 3 rounds, expressed as a percentage of the total MHz-pops of all licenses. The auction is divided into 3 phases depending on how high the activity level is. In each round, a bidder's actual "activity" is required to be less than its "allowed activity". Its actual activity in a round is the sum of the MHz-pops for (a)

those licenses on which it submits rule-conforming bids, and (b) those **other** licenses on which it was a highest bidder in the previous round. Its allowed activity is adjusted each round, depending on the phase. The minimum percentage increment in the highest bids can also depend on the phase.

I. Preparations for the Broadband PCS Auction

The FCC announces the date on which the auction begins and the due dates for short-form applications and initial deposits. Each license is identified by the MTA or BTA to which it pertains, applicable restrictions to designated entities, exclusion of cellular providers, its spectrum block location and bandwidth, and its MHz-pop capacity measure. The FCC publishes any restrictions imposed on the auction, such as reserve prices and licenses reserved for a single round of sealed bids.

Based on their short-form applications, those firms qualified to be bidders are determined. The short form includes a question requiring the prospective bidder to report the BTAs in which it is a cellular provider under the rules specified by the Commission. The Contractor publishes the list of prospective bidders who filed short-form applications. The list indicates those that are designated entities, those that are cellular providers, and for each cellular provider, the BTAs in which that bidder is restricted to a single 10-MHz band. The FCC describes the applications for waivers and their dispositions.

The Contractor distributes to each bidder a description of the general auction procedure and the bid submission procedure. It provides a microcomputer diskette with a file containing the standard spreadsheet to be used for bid submissions, and a copy of the standard hardcopy form to be used as a backup. [These are described in parts II and III below.] The diskette includes spreadsheet macros that enable a bidder to conduct its own check that a submission conforms to the general rules of the auction. Bidders are allowed to make trial submissions to ensure that the procedures are understood, that the bidder's diskettes can be read accurately by the Contractor's equipment, and that the rules for acceptable bids and acceptable submissions are understood, including the Activity Rule [described in part III]. The Contractor provides a room with telephones and microcomputers loaded with spreadsheet software so that representatives can make minor alterations to submissions on the premises.

Shortly before the auction, each bidder provides an initial deposit in the amount of 2 cents per megahertz per pop for which it is allowed to bid. The number of MHz-

pops included in the initial deposit establishes that bidder's allowed activity in the first round of the auction.

Each bidder designates its representatives authorized to submit bids, a means of identification for each representative, and a fax number for receipt of communications in the event of disruption of the standard auction procedure. The Contractor publishes the list of bidders, their initial deposit amounts or their initial allowed activities, and their authorized bidder representatives. Each bidder is provided a public identification name or number, and a secret password to facilitate validation of bid submissions. Each bidder is allowed to provide beforehand a letter of credit from which later it can draw the 20% upfront payments required from winning bidders. The FCC deposits these letters with a bank or bonded agency; the amounts of these credits remain secret.

II. General Auction Procedure

Each morning of a business day, the Contractor announces publicly whether the auction continues that day, is delayed, is tentatively closed, a default has occurred after a previous tentative closure, or is to be resumed the next day after a tentative closure and default. If no announcement is made or it is announced that the auction continues then the auction continues that day, which initiates a round. The announcement of continuation can include a specification that the round will last more than 1 day, as for instance when bids will be accepted only according to the backup procedure based on hardcopy submissions that will be processed by hand. If the auction is delayed then no bids are accepted that day and the auction reopens on the morning of the next day the Contractor announces that the auction continues.

If the auction is tentatively closed then the Contractor immediately publishes a list showing the tentative winner of each license and the amount bid. Each tentative winner of a license must augment its initial deposit up to the required 20% upfront payment by the end of the next business day. The portion of the upfront payment in excess of the initial deposit can be provided by a letter of credit (possibly submitted in advance), a certified check, or an electronic funds transfer. If all upfront payments are made on time then the auction is closed, not to be reopened. This initiates the period in which each winning bidder must complete the long-form application and provide the remainder of its bids, and the FCC considers petitions to deny.

The FCC declares a default the next morning if any tentative winner failed to provide all of its required upfront payments by the time specified. Each tentative

winner that defaults on any upfront payment is automatically disqualified from every license and barred from any further bidding, and its initial deposit is forfeit. In the event of default, the Contractor publishes a list of the defaulting bidders and the affected licenses. It also announces a revised official status of the auction [as described below] in which for each license on which a default occurred a reserve price is imposed. The reserve price is either (a) the previous reserve price (if any), or (b) 80% of the previous highest bid among nondefaulting bidders for that license, whichever is larger. All upfront payments in excess of the initial deposits are returned or refunded, and the auction resumes on the following day in phase III.

On a day on which the auction continues, so that a round is in progress, the Contractor conducts three activities, as follows.

(1) By 9 AM it publishes an official status report in a standard form that lists for each license the number of new acceptable bids received the previous day, the amount of the current highest bid, and the identity of the bidder offering the highest bid. It also specifies for each license the minimum amount that a new bid must exceed the previous highest bid in order to qualify as a new higher qualified bid according to the bid-increment rule. This status report is made available on an electronic bulletin board, as well as on hardcopy and a diskette obtainable from the Contractor. [This official status report confirms or amends, and amplifies, the tentative status report posted on the electronic bulletin board the previous evening; see part III below.] A bidder's representative can confirm privately its allowed activity for the next round by inquiring at the Contractor's office.

(2) During business hours until 5 PM, the Contractor receives bid submissions from qualified bidders at a Washington office, and also at designated field offices where receipt of submissions closes at 5 PM local time. After checking the qualification of the bidder and verifying the identity of its representative, each submission on a diskette is read into the Contractor's computer, which immediately checks that the submitted bids conform to the rules [see part III for these rules], and if so, provides the representative with a worksheet file read onto a diskette and a hardcopy version for visual inspection and confirmation. When the representative authorizes that the submission has been entered correctly, the bids become official submissions. If a bidder makes multiple submissions in the same round then the last one submitted overrides previous submissions.

(3) At the close of the bid submission period, the Contractor completes further checking and produces a hardcopy version for verification and confirmation by its personnel and possibly an FCC representative. A tentative status report is then posted on the electronic bulletin board, but without the identities of high bidders. The identity of the high bidder for each license is posted only at the beginning of the next round when the official status report is issued after further examination to ensure that all rules have been followed. The official status report also states the phase and the minimum bid for each license in the current round based on the reserve prices and the bid-increment rule. The Contractor calculates each bidder's allowed activity for the current round based on the Activity Rule and the bidder's allowed and actual activity in the previous round.

On a day on which the official status report reveals that no license has received a qualified bid exceeding the reserve price (if any) and higher than the previous highest bid (if any) for that license by the requisite bid increment, the Contractor announces the tentative closure of the auction. This initiates the call for the 20% upfront payments from the tentative winning bidders.

To avoid a worst-case scenario in case of inordinate delays in the auction, the Commission can exercise one of two options at its discretion. The first is that at any time it can accelerate progress by moving the auction to the next phase [see part III for the description of a phase]. The second is that it can conclude the auction at any time after 40 rounds by issuing a call for final bids on the following business day for each of those licenses for which the highest bid increased in at least 1 of the preceding 3 rounds. In this case, no new bids are accepted for licenses on which the highest bid did not increase in any of the preceding 3 rounds. The highest final bid for a license wins only if it exceeds the reserve price and the previous highest bid for that license; otherwise, the license is won by the previous highest bid.

The Commission can delay, suspend, or cancel the auction, declare invalid all of the previous day's submissions, and suspend or modify temporarily the Activity Rule, in the event of a natural disaster (such as a hurricane or an earthquake), or a technical or financial impediment (such as collapse of regional communication systems or extreme developments in financial markets), or upon evidence of breach of auction security or unlawful activity that affects the conduct of the auction. In such cases, the Contractor resumes the auction starting from the official status reported at the beginning of the

current or some previous round; or if necessary, the Commission can cancel the auction pending plans to reschedule it entirely.

III. Bid Submission Procedure

Each bidder has access each evening to the tentative status report on the electronic bulletin board, and at 9 AM it is able to verify, from the official status report, for each license: the highest bid and the identity of the highest bidder in the previous round, and the minimum amount of an acceptable bid in the current round. To be acceptable, a bid must exceed that license's reserve price, if any. An acceptable bid in the current round must exceed the previous highest bid (if any) by the amount of the mandatory bid increment. A bid less than the minimum acceptable bid is treated the same as no bid.

A bidder may prepare one or more bid submissions each round and deliver them before 5 PM via one of its authorized representatives to the Contractor. (If no submission is made then the bidder may be restricted later by the Activity Rule described below. Each bid submission filed within the same round overrides previous submissions.) The bidder's qualification to bid and the representative's identity are verified. The bids are submitted on a signed hardcopy version in a standard format and on a diskette on which is a file in a standard spreadsheet format that lists the licenses and, for some, the bids submitted. The spreadsheet has a header for the bidder's identification information, a column listing each license (organized by blocks and MTAs and BTAs, and regionally) and a column for the specification of bids (for those licenses on which bids are offered by this bidder). Upon submission, this information is read into the Contractor's computer where the bidder's identification information and the submitted bids are entered into a matrix that incorporates all current bids as well as reserve prices and the highest bid and bidder on each license from the previous round. After this file has been read electronically, the identification and the password checked, and conformity to the rules verified, a hardcopy printout of that bidder's submission information stored in the computer is produced for the representative. The representative confirms the submission by comparing it with the signed hardcopy version. Upon confirmation by the representative, the bids become official submissions that cannot be withdrawn, excepting only that a later submission in the same round overrides previous submissions in that round.

To be acceptable, a submission must conform to two sets of rules, as follows.

A. The general Eligibility Rules require that: (1) the bidder has been determined at the pre-auction stage to be qualified, and has not previously been disqualified due to a default, (2) a bidder cannot bid for BTA blocks C and D unless it is a designated entity, (3) a cellular provider's activity in a round cannot include more than a single 10-MHz block for each BTA in its service territory, (4) a bidder's activity in a round cannot include more than 40 MHz in any MTA or BTA, (5) each bid must exceed the reserve price (if any) for that license, and (6) each bid must exceed the previous round's highest bid (if any) by the amount of the mandatory bid increment for that license.

Regarding (3), a cellular provider cannot bid for a 10-MHz BTA license within its service territory if in the previous round it was the highest bidder for some other license in that BTA. Regarding (4), a bidder cannot bid for licenses in (or including, via an MTA license) a BTA if those licenses together with those other licenses on which it was the highest bidder in the previous round exceed 40 MHz in or including that BTA. A bidder cannot bid for a 30-MHz MTA license if in the previous round it was the highest bidder for the other 30-MHz license in that MTA.

B. The Activity Rule is the following. The activity level of the auction is the sum of the MHz-pops of those licenses whose highest bid increased in at least 1 of the previous 3 rounds, expressed as a percentage of the total MHz-pops of all licenses. The auction is divided into 3 phases. The auction is initially in phase I and it continues in phase I until the auction activity level is less than 5% for 2 consecutive rounds, whereupon it reverts irreversibly to phase II. Similarly, the auction remains in phase II until the auction activity level is less than 2% for 2 consecutive rounds, whereupon it reverts irreversibly to phase III. Once in phase III it remains there.

Associated with each phase is a multiplier: 3.0 in phase I, 1.5 in phase 2, and 1.0 in phase III. The multiplier is used to calculate each bidder's allowed activity in each round of that phase. A bid submission conforms to the Activity Rule if the bidder's resulting activity for that round (based on the submission and those licenses on which it was the highest bidder in the previous round) is no more than that bidder's allowed activity.

A bidder's allowed activity in a round is calculated recursively as follows. At the start of the auction, a bidder's allowed activity is the same as the number of MHz-pops for which it provided the initial deposit of 2 cents per MHz-pop. Thereafter, in each round it is either (a) the allowed activity in the previous round, or (b) the multiplier of

the phase in the previous round **times** the bidder's activity in the previous round, whichever is smaller. However, this rule is subject to waiver: if a waiver is granted then only case (a) applies and therefore the allowed activity for the current round remains the same as the previous round's allowed activity. A waiver is granted upon request if no waiver was granted in either of the previous 2 rounds, and in this case it is granted automatically. Each bidder is also allowed 2 free waivers in case of a logistical impediment or clerical error.

A bidder's allowed activity is never more than the number of MHz-pops for which it provided the initial deposit of 2 cents per MHz-pop, though it may be smaller if no waiver is granted. From one round to the next, either the allowed activity remains unchanged, or if the bidder's activity is less than the ratio of its allowance to the multiplier then it decreases. In phase III a bidder's allowed activity each round is the same as its actual activity the previous round. In any phase, if a bidder has exhausted its free waivers and is then inactive in 2 consecutive rounds, then necessarily it is ineligible for a waiver, its allowed activity is nil in subsequent rounds, and it is precluded from further submissions.

The mandatory bid increment is either 5% or \$5 million, whichever is smaller. Alternatively, the bid increment may depend on the phase and the type of license, as shown in Tables A and B on the next page.